Governance of Special Information Centers: The Knowledge Availability Systems Center at University of Pittsburgh

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WHEN THE SOVIET UNION launched the Sputnik satellite in 1957, the age of space exploration got underway in the United States. The National Aeronautics and Space Administration (NASA) was granted sizable sums of money to create the technology to enable the United States to catch up to and surpass the Soviet Union in the space race. A group of senators and congressmen felt that the benefits of a space program should be more than winning a race for technological prestige. Thus, the appropriations bill called for a program of technology transfer. To implement a program that would effectively transfer technologies developed by NASA and its subcontractors to the industrial and commercial sectors, a network of six regional dissemination centers was established across the United States. The Knowledge Availability Systems Center (KASC) at the University of Pittsburgh was one of these centers.

The charge from NASA to the regional dissemination centers was to effect technology transfer of the research and development (R&D) activities related to the space programs. This is the stated goal of KASC. To help the regional centers attain this goal, NASA made arrangements to have the R&D reports of subcontractors, as well as other related literature, indexed and recorded on magnetic tape for distribution to the regional dissemination centers. The data on the tape were also published in two printed sources produced by NASA: IAA and STAR. KASC made arrangements to search the magnetic tape version of IAA and STAR on the University of Pittsburgh's computer system, thus permitting large

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numbers of complex searches to be performed very quickly. The NASA file has grown at the rate of approximately 5,000 documents per month since 1963. The total NASA file now contains over 800,000 documents.

Beginning in 1963 with the objective to transfer NASA technology to the private sector, KASC spent its early years building the necessary computerized information retrieval capabilities, developing and promoting a market within private industry for information services, building an organization with the necessary talents to provide a high level of information services, and developing operational and fiscal policies and procedures necessary to the governance of a special information center. The decision-making within KASC in 1976 necessarily dealt with marketing, personnel, fiscal policies and operational policies. Although NASA provides KASC with approximately 50 percent of its budget, it is KASC's responsibility to "sell" its services to industrial clients. Thus, KASC does not provide "free" information service, as is thought to be the case with libraries. The concept of charging for information services is a difficult one for many to accept, but is becoming more widespread today. The increase of information retrieval services from Lockheed, Systems Development Corporation (SDC), BRS and others has changed the nature of the information business over the past five years. KASC has had to make some interesting decisions in order to offer information services that are needed, but at a price that can be afforded by the clients and at the same time covers the associated cost of providing these services.

In addition to the NASA file, KASC and the other centers either process or access other computerized files of information. Each center leases and performs searches on one or more files in addition to the NASA file. KASC spins the *CA Condensates* file for its own clients as well as for its sister Regional Dissemination Center (RDC). KASC in turn purchases information services for files that are searched by the other centers. KASC has also found it necessary to utilize the services of the Lockheed and SDC commercial information retrieval services. The decision to utilize this wide variety of information vendors is one dictated by the marketplace and by the need to be cost-effective in terms of operating an information center.

In addition to the NASA regional dissemination center, KASC has a research and development division which performs basic research and develops information-related products for governmental, educational and industrial clients. Examples of efforts in this area are the generation of specialized thesauri, compilation of indexes, and production of bibliographies.

ORGANIZATIONAL STRUCTURE

The organizational chart shown in Figure 1 illustrates the organizational structure of the University of Pittsburgh of which KASC is a part. The organizational hierarchy both within the university and within the Regional Dissemination Center — renamed in 1976 the NASA Industrial Application Center (NIAC) — has an internal organization as shown in Figure 2. The KASC information center follows the traditional structure found in most organizations with the exception that NASA has certain controls over policy decisions and the scope of the center's activities. The source of NASA control is based on its allocation of funds to KASC. Likewise, the university maintains its control over KASC from the provost's office. The source of university control lies in its allocation of some supporting funds and of facilities such as a computer system, utilities and space, as well as the use of the university name for marketing purposes. Engineers from the School of Engineering at the University of Pittsburgh work as technical analysts/consultants who supplement the technical analysis staff of KASC.

OPERATIONAL STRUCTURE AND DECISION-MAKING

MARKETING

The assistant director of marketing and his staff are responsible for marketing information services available from KASC to the industrial community. This involves the identification of potential clients within a geographical region that can be covered by the available sales staff. Leads for the sales staff are generated in a number of ways. An active mailing program that distributes promotional literature to potential clients is utilized. The mailing list is derived from Dun & Bradstreet's mailing list service. The important decision to be made regarding the Dun & Bradstreet list is which subset of the entire list to select as having a high probability of utilizing the information services provided by KASC. Experience has shown that very small organizations (in terms of number of employees and size of the R&D budget) do not have a high potential for becoming clients of KASC. In addition, certain types of industries, such as clothing and wood producers located in the geographical area around Pittsburgh, have a low potential for becoming clients. Mailings must therefore be restricted to those organizations with high potential for becoming clients in order for a mailing program to be cost-effective.

KASC also has sales seminars to which prospective clients, former cli-

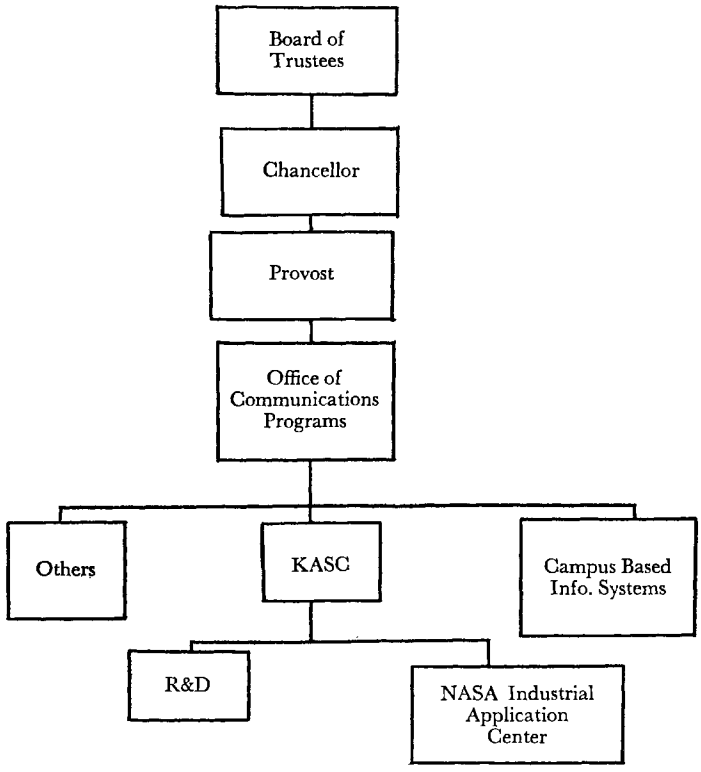

Figure 1. Organizational structure of University of Pittsburgh

ents and present clients are invited. These seminars are partly educational and partly sales in nature. The intent is to provide an ongoing awareness of the developments in the information industry and of the services that KASC can provide. These seminars also provide feedback to KASC in terms of evaluating its existing services as well as acquiring ideas for new or improved services. After a sales seminar, sales staff make followup calls on the attendees. Prospective clients for the sales seminars are also derived from the Dun & Bradstreet listings.

Calls are also made on prospective clients who neither attend a sales seminar nor respond to mailings. Each salesperson has a geographical territory for which he or she is responsible, and is required to make a minimum number of calls per week. Typically, appointments are arranged one week in advance, with the highest level of management possible. The

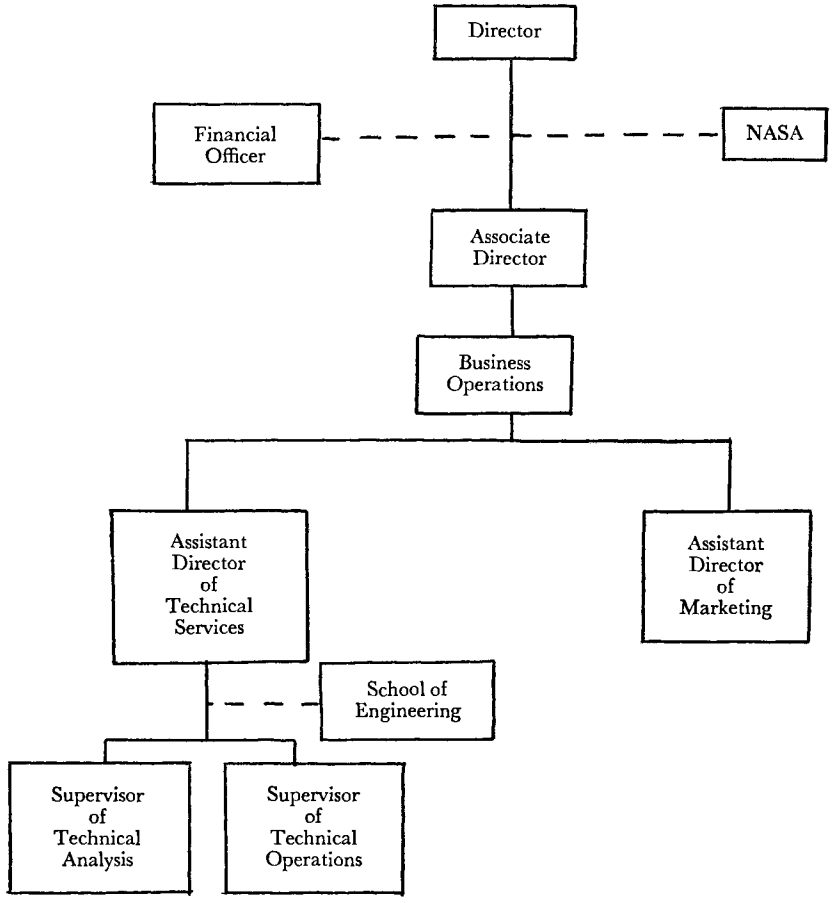

Figure 2. Internal organizational hierarchy of University of Pittsburgh and NIAC

philosophy of attempting to make calls on high-level management (as opposed to a librarian or information officer in a company) is that the final decision to purchase information services is made at that level and not at the lower staff level. Therefore, the decision-maker is the one who needs to understand the value and nature of the information services that can be provided.

Another responsibility of the marketing staff is to recommend the type of information services that will best meet the needs of industrial clients.

This is based on the marketplace rather than on what has traditionally been done. KASC has a variety of information service packages that will appeal to everyone from the one-time user who desires a state-of-the-art or in-depth analysis of a current problem, to the perennial subscriber for a combination of current-awareness (SDI) service, retrospective searches, and in-depth analysis of current problem areas.

Traditionally, a particular problem was matched with a particular file and a search was run against that file. KASC found that most problems are interdisciplinary in nature; therefore, KASC offers the searching of as many files as seem appropriate for a particular problem area. This service provides the client with multiple points of view concerning the problem and frequently leads to creative solutions that could not be achieved through use of a single file for the search.

The need to increase the client base in an information center requires creative marketing approaches based on the services and products that can be viewed as necessary and valuable to the client. The difficulty lies in the fact that the client wants assurance that the search will provide a solution to a problem; the information center is unable to guarantee such results. The lack of such assurance creates a degree of doubt in the potential client's mind as to the value of the service and requires a high degree of salesperson skill and knowledge to remove the uncertainty from the client's mind. A salesperson must be able to counter the objections by the client with information related to the client's business and the value of information services. One method of overcoming the client's doubts may be to explain that a search can reveal other unsuccessful attempts to solve the same problem. The client is saved from expending resources on proven unsuccessful approaches to solving the problem. On the other hand, the discovery of no results at all concerning the problem area may indicate that finding a solution to the problem may be beneficial in terms of selling the solution to others. The basic concept is to build confidence in the fact that information has value, whether it provides a solution to the problem, a partial solution to the problem, or no solution at all. In any case, information provides for better decision-making on the part of the client.

In pricing its services and products, an information center must make a difficult decision. The marketing staff must make these decisions in conjunction with the technical operations staff. The basic information required to make pricing decisions is the cost of providing a given service or product. This requires a detailed task analysis of the time and materials required to produce a particular service or product. Other factors of a

pricing decision include: (1) whether the marketplace is willing to pay the desired price for the product, and (2) whether the price is competitive with similar services available from other sources. The proliferation of competition in the information industry has made pricing decisions more difficult, but has encouraged information centers to explore methods to reduce the cost of providing services.

Marketing in conjunction with technical services must also assume the responsibility for followup and evaluation. This requires a rigorous program of alerting sales personnel to contract expiration and of periodic inquiries regarding satisfaction with the services and product provided. Marketing offers a means of evaluating the center's services and products. In addition, it gives feedback to technical services regarding the performance of staff in terms of competence, quality of service and responsiveness. Followup and evaluation also provide marketing with some guidelines for marketing program effectiveness and with ideas for new marketing approaches. Marketing is thus a critical and complex aspect of an information center, and produces the revenue by which the center survives. The decisions made in marketing are highly important to the center in terms of budget, staffing, operations and policy.

TECHNICAL SERVICES

Technical services provide the production and distribution capabilities of KASC. When a sale has been made, the client is referred to the technical analysis section. Each client is assigned to a technical information specialist with expertise in the subject area of the client's major interest. KASC's technical analysts have specialized training and experience in fields such as chemistry, engineering, and business. In addition, engineers from the School of Engineering perform analysis functions, as well as act as consultants to the in-house analyst staff. An analyst must not only be versed in the subject area of the problems a client poses, but must also have expertise in the area of information science. He/she must know the proper information resources to utilize in order to retrieve data relevant to the client's questions. The analyst must also be adept at negotiating the question with the client. In most instances the client is a highly qualified expert in his field; this places responsibility on the analyst to understand the client's problem at a sophisticated level. The analyst must foster the client's confidence in his or her ability to deal with the client's problem, and must then translate the client's problem into a form that is searchable using a computer search program. Because KASC utilizes several search systems in addition to its own, the analyst may need to write the search

strategy in several different forms using different vocabulary control mechanisms. The analyst must know both the protocols of several different search systems and the contents and characteristics of several different data bases. The analyst may then conduct part of the search on one of the on-line systems utilized by KASC (e.g., Lockheed or SDC), or may send the search to technical operations to be searched in the batch mode. The constraining factors for the analyst are time and money. Although an analyst is frequently compelled to perform a search that is very broad in nature so that the probability of missing an item of importance is quite low, the cost of such an approach is very high; furthermore, the more items produced by a search, the more time the analyst must spend eliminating the nonrelevant material (noise). Thus, the analyst must attempt to perform a search wherein the tradeoff between cost and effectiveness is reasonable, and therefore must understand specifically what information the client requires. In some cases the analyst must use creative approaches in the retrieval of relevant information. If a client desires to know the market possibilities for glass insulators for the utility industry, for example, it may not be possible to access information directly using the key term or concept of glass insulators. The analyst must seek approaches for searching appropriate files using concepts not directly related to glass insulators — such as determining the predicted number of miles of electrical or telephone wires to be strung in the future and then computing the number of glass insulators required.

Once a search has been completed, the results are delivered to the analyst, who then performs additional analysis of the output. In the simplest case the analyst will simply review the output and mark those items that are relevant to the original problem posed by the client. In a complex case, however, the analyst may analyze the results, classify them according to various dimensions of the problem, and write a report summarizing the results of the search. This procedure may take from five to twenty-five hours, depending on the complexity of the problem and the extent of the output.

The analyst is responsible for following up each client's search results to determine if the client has been satisfied and if the results have been useful. This is done in several ways, but the most direct method is a telephone call after the client has had sufficient time to peruse the results. The use of a questionnaire has also helped to determine the strong and weak points of the services provided. NASA requires that KASC document technology transfers in terms of dollar value. Therefore, if a client has applied the results of a search to solve a problem, improve a process, reduce cost, in-

crease a market, or similar actions, the analyst is responsible for documenting these cases and for getting the client to document the dollar value to his organization. A program of technology transfer is consequently the responsibility of the analyst staff. Because technology transfer is usually spread over a lengthy period of time after the search results have been provided, a regular schedule of contacting clients for technology transfer followup must be executed. This requires a comprehensive recordkeeping system and an efficient method of alerting analysts when to make followup calls. In some cases the analyst must visit the client's organization to ensure adequate documentation of a technology transfer case.

The analyst staff must keep an accurate in-process tickler system to know the status of each search for each client. This system is designed to provide the client with timely service. It also provides an analyst with the means to determine both the status of any search in the system and how long it has been waiting at any one stage. In addition, a system of keeping clients aware of their contractual obligations (in terms of getting the number of searches completed within the time frame agreed upon) is also maintained by the analyst staff. The tasks of keeping the in-process status of each search and of ensuring that each client's service is on schedule require an extensive amount of paperwork and monitoring. It is important to keep the client on schedule because a client only pays for services performed — not necessarily for the amount of service agreed upon. Changes in the contractual arrangement and method of payment required could eliminate a great deal of both recordkeeping and telephoning clients to remind them it is time for another search.

The technical operations staff is the other half of technical services. The major responsibility of this group is to assemble the information package for the client and distribute it to him. In addition, this staff performs searches on the KASC-maintained files and transforms vendor magnetic tapes into a searchable format. The programmer in this group also performs functions relating to the business operations and a management information system. One very special section of technical operations is the "documents" section. Its purpose is to provide documents to clients who wish to order them through KASC. This service closes the loop in terms of a total information service. The results of searches that a client receives from KASC contain a simple order form that can be completed and returned to the documents section; this saves the client from attempting to locate and copy a document for his use. KASC orders documents from all over the world for this heavily used service.

All search results, whether run on the University of Pittsburgh computer

system or from an outside source, are delivered to technical operations. The search results are matched against an action form, sent to technical operations from technical analysis, that details what files were searched on what systems, the title of the search, and the client's identification code. When the search results arrive they are separated and cut into easily handled form and then returned to the analyst responsible for review and/or report-writing. The results of the analyst review are eventually returned to technical operations for final packaging and distribution to the client. The procedures in technical operations are characterized by a large amount of clerical work and recordkeeping. Technical operations maintains a file on every client which contains a complete description of every search performed. These files are periodically microfilmed to reduce storage space requirements. In addition to the recordkeeping and clerical work, technical skill and knowledge are required to maintain the computerized files and to submit searches.

KASC has maintained a philosophy that the manner in which the information is packaged both logically and physically makes it more useful as well as attractive to the client. A considerable amount of effort is therefore expended in technical services to produce a product that is organized and formatted in a useful manner and is also a professional-looking product. It is difficult to assess the cost-effectiveness of this approach, because other relatively successful information services do not put as much effort into this aspect of their service as KASC does. The effect of an attractive package for marketing and sales purposes is nevertheless probably justified in today's society of slick-looking products.

The supervisor of technical operations has a responsibility to collect statistics concerning all activities in that section. These data are summarized each month and act as a measure of the level of activity of the center. They also permit some interesting insights into which files are being used, how active certain clients have been, how many document orders have been placed and received, and many other aspects of actual operations. These data are invaluable in staffing and scheduling in the operations area, and are also useful to the marketing section in understanding what services are being utilized most heavily and the activity level of certain clients.

The operations section has its own programmer, who is responsible for maintaining all search programs, file conversion programs, and file maintenance programs. The programmer is also responsible for program enhancement for more efficient and effective operation. A number of business application programs are also written, improved and maintained by

the programmer. These programs handle accounts receivable, invoicing, contract renewal and status reporting.

BUSINESS OPERATIONS

Business operations are administered by the associate director of KASC. The primary function of business operations is to control the flow of money between income and expenditure for the NIAC operations. Although the financial officer is responsible to the university for accounting purposes, the business operations section of the NIAC controls its contractual agreements, invoicing, receivables, expenditure request, sales commission, accounting, general client accounting, budgeting, and reporting. Several of these functions are automated to ease the clerical effort involved. The business section maintains a complete file of all contractual agreements, services performed and correspondence with clients. These functions are typical of most business operations found in commercial establishments selling products or services. The center is audited by both the university and NASA and must therefore maintain accurate and up-to-date records.

The data from business operations and technical services provide the basis for management information that is utilized in the decision-making activities of the center. The data from business operations also provide the basis for constructing a budget. The budget established by the NIAC is based on the NASA contribution, the university contribution, and the estimated income from the various products and services sold by the center. Attempting to estimate income depends on the number of sales personnel, the size of the marketing budget, and the services and products offered for sale. Deviations from known successful patterns involve risk. Because the center may not run a deficit operation, radically new programs of marketing, technical operations, or services and products are not instituted without prior testing and weighing of the costs and benefits involved. The management information supplied by business operations therefore, offers an important measure of performance for planning future operations.

CRUCIAL AREAS OF GOVERNANCE

The most important and time-consuming areas of decision-making and policy formulation for an information center such as KASC are: (1) budgeting, (2) marketing, (3) personnel, (4) evaluation, and (5) control of operations. The fact that KASC must operate similar to a commercial

enterprise in an academic environment places many constraints on the budgeting process at KASC. NIAC is considered by the university to be a research organization and is thus governed by the budgeting policies and procedures of research accounting. As a result, most commercial establishments typically have more flexibility in the budgeting process than does NIAC. The constraint of research accounting eliminates high risks but reduces the capability to be highly innovative in operations. Certain university policies regarding overhead rates, personnel classifications and expenditures cause the budget to look much different than it might if these constraints were removed. Moreover, certain NASA requirements, such as documenting technology transfers, cause various resources to be allocated to meet these requirements. In addition, budget increases based on estimates of increased sales of services and products are viewed with conservatism. Changes in services and operations are consequently made at a slower pace than might be desired.

Marketing requires creativity, and it demands more crucial decisions than most other areas of the information center. Identifying potential clients and new services can be an expensive and time-consuming process, requiring innovative approaches and hard work to perform these tasks with limited resources. Marketing must also train, schedule, motivate and monitor a sales force. This requires a host of decisions, ranging from defining geographical territories to determining the proper commission algorithm that will motivate but not permit overselling or dishonesty. The design of new and better services requires a constant evaluation of the attitudes, needs and demands of the user community. Marketing must also be able to create a demand for a new service or product; this requires promotional literature and a sales story that states fairly the attributes of the service or product without giving false impressions.

Personnel decisions in a university environment are difficult at best, but attempting to operate an information center as described above makes them nearly impossible. The fact that KASC must abide by the personnel policies and procedure of the university generates a host of problems in governing such a center. The university did not plan its personnel classification system to include marketing people, sales people or information analysts. Therefore, obtaining classifications and descriptions for such jobs is a rigorous ordeal, as is establishing a pay scale competitive with industry. In many cases, top-level people cannot be attracted to information center jobs because the pay is too low. Personnel policies regarding promotion, evaluation, dismissal, raises, transfers, and affirmative action similarly pose many difficulties in the operation of a center such as KASC.

The decision related to hiring personnel is a difficult one. The tradeoff between acquiring individuals who are technically competent in a special subject area but who lack training in the information industry, and individuals who are trained as librarians or information scientists without technical knowledge, is not at all clear. KASC has tended to hire individuals who are technically competent in a subject area and then train them in the information business. Selection of marketing and salespeople who can perform well in the information industry is quite important to the survival of an information center such as KASC; these staff members have typically been drawn from industry and have very little knowledge of information centers and their activities. This again requires a training program.

The activities of an information center such as KASC must be evaluated in order to make decisions concerning the center's operations and/or continued existence. Evaluation requires a certain amount of control over the center's activities. Determination of the degree of control necessary is based on cost-effectiveness — i.e. evaluative purposes should not require more control than can be justified in terms of benefits. For example, spending an additional $10,000 to increase control over an operation that will result in a $5,000 benefit is not cost-beneficial. This philosophy should also be applied to the control of personnel as well as of operations.

The decision-making activity in an information center is quite varied and parallels that of a business firm; it can reside in a single person or can be delegated to those responsible for a certain area of activity. By centering all decision-making in one person, a certain degree of total control is felt by the decision-maker while, in fact, there are more decisions to be made than one person can manage. Under these conditions, very few decisions are actually made and those that are will probably be of little value to the total organization. A delegated and shared method of decision-making is required if a complex organization is to prosper and find direction for its functions and motivation for its people. The crucial aspects of how much control over operations is required and the mechanisms for monitoring and exerting that control are not simple decisions. The tendency to overmonitor and to overcontrol is natural but is also very costly, not only in terms of the resources that must be committed to such activities, but in terms of employee morale. In an environment in which too much monitoring/control is exerted, employees feel that management has little or no confidence in their abilities. On the other hand, an organization with limited resources and a need to generate income must maintain tighter

controls over its activities than organizations with greater resources or no need to generate income to cover the cost of operations.

MEASURES OF PERFORMANCE

An information center that sells its services in order to survive must guarantee that its employees and its activities and services satisfy some measurable criteria. KASC has attempted to establish performance measures that coincide with both its stated goal of providing technology transfer and its real goal of survival. Therefore, each of the activities has some measure of performance that strives to ensure the achievement of these goals. For example, each salesman is required to make a certain number of calls per week and to produce a certain dollar volume of sales. An analyst is expected to complete search analysis within a certain time frame and to document a certain number of technology transfers. In addition, a specified level of quality is expected in the products produced. This can be measured by the number of letters of praise versus letters of complaint, as well as by the evaluation process.